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Maldives Monsoon and Sea Level

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Proceedings of the International Ocean Discovery Program

Volume 359

Maldives Monsoon and Sea Level

Expedition 359 of the riserless drilling platform

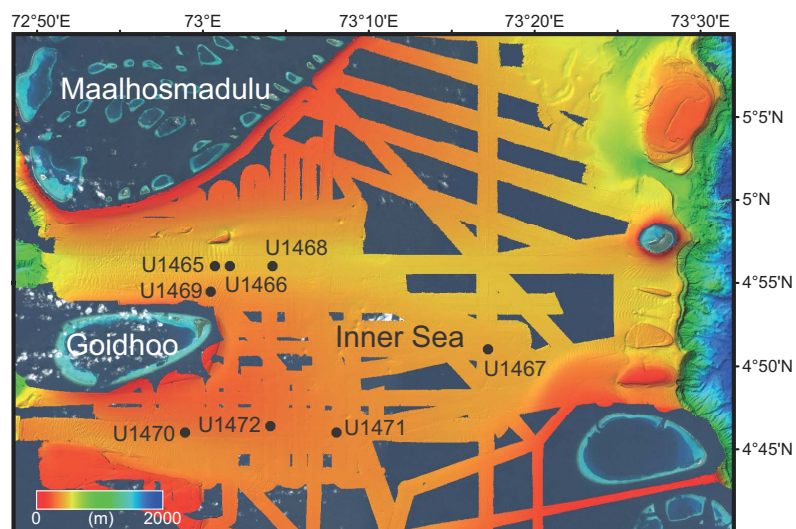
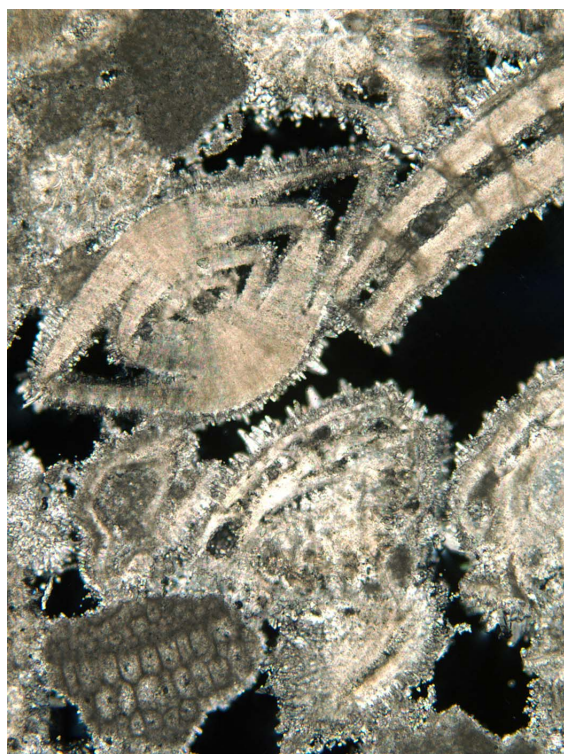
Darwin, Australia, to Colombo, Sri Lanka

Sites U1465–U1472

30 September–30 November 2015

Volume authorship

Betzler, C., Eberli, G.P., Alvarez Zarikian, C.A., and the Expedition 359 Scientists



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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the participating agencies, TAMU, or Texas A&M Research Foundation.

The bulk of the shipboard-collected core data from this expedition is accessible at <http://iodp.tamu.edu/database/index.html>. If you cannot access this site or need additional data, please contact Data Librarian, International Ocean Discovery Program *JOIDES Resolution* Science Operator, Texas A&M University, 1000 Discovery Drive, College Station TX 77845-9547, USA. Tel: (979) 845-8495; Fax: (979) 458-1617; Email: database@iodp.tamu.edu.

A complete set of the logging data collected during the expedition is available at <http://brg.ldeo.columbia.edu/logdb>. If you have problems downloading the data, wish to receive additional logging data, or have questions regarding the data, please contact Database Administrator, Borehole Research Group, Lamont-Doherty Earth Observatory of Columbia University, PO Box 1000, 61 Route 9W, Palisades NY 10964, USA. Tel: (845) 365-8343; Fax: (845) 365-3182; Email: logdb@ldeo.columbia.edu.

Supplemental data were provided by the authors and may not conform to IODP publication formats.

JRSO expedition photos are the property of IODP and are in the public domain.

Some core photographs have been tonally enhanced to better illustrate particular features of interest. High-resolution images are available upon request.

Cover photograph shows dogtooth cements in *Amphistegina*. Photo credit: IODP JRSO.

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Jeremy R. Young, Santi Pratiwi, Xiang Su, and the Expedition 359 Scientists

Core descriptions

Visual core descriptions (VCDs), smear slides, and thin sections are combined into PDF files for each site. The entire set of core images in PDF is available in the IMAGES directory.

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Supplementary material

Supplementary material for the Volume 359 expedition reports includes DESClogik exports in Microsoft Excel, SHIL log sheets in PDF, and an oversized figure of the transects in AI format with a caption in Microsoft Word. A full list of directories can be found in SUPP_MAT in the volume zip folder or on the [Supplementary material for Volume 359 expedition reports](#) web page.

Expedition research results

Data reports

Titles are available in [HTML](#).

Syntheses

Titles are available in [HTML](#).

Drilling location maps

A site map showing the drilling locations for this expedition and maps showing the drilling locations of all International Ocean Discovery Program (IODP), produced using QGIS (<http://www.qgis.org>), and Integrated Ocean Drilling Program, Ocean Drilling Program (ODP), and Deep Sea Drilling Project (DSDP) expeditions, produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.F. Smith (<http://gmt.soest.hawaii.edu>), are available in PDF.

[IODP Expedition 359 site map](#)

[IODP map](#) (Expeditions 349–356 and 359)

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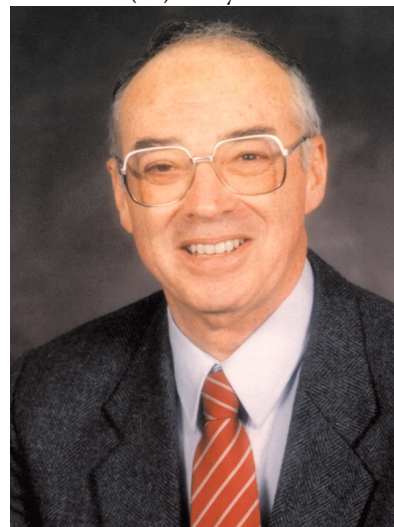
Dedication

We dedicate this volume to Ed Purdy for his seminal work on the Maldives carbonate platform. In addition to his pioneering studies on modern carbonates of the Bahamas and Belize, Ed was a driving force behind seismic and core studies in the Maldives to further the investigation of Neogene platforms and their response to sea level change.

Acknowledgments

This research used samples and data provided by the International Ocean Discovery Program (IODP). We thank all of the personnel aboard the R/V *JOIDES Resolution* during Expedition 359 for their skill and dedication. Particular thanks go to the Technical Support staff for the quality and timeliness of their work. We greatly appreciate the qualified advice from the entire drilling crew and their efforts to core the challenging carbonate sections. The success of the expedition was also enabled by the help of the Environmental Protection and Safety Panel, which allowed us to readjust our drilling strategies even during the expedition. Dr. Mohamed Shainee is thanked for personal support that allowed us to drill in the Maldives. The editorial staff at the IODP *JOIDES Resolution* Science Operator at Texas A&M University is thanked for support with publication of this document. We thank Andre Droxler for initiating the planning for an IODP expedition to the Maldives and the other drilling proposal proponents, as well as the members of the Science Evaluation Panel (Chair: Dick Kroon) for making Expedition 359 possible.

Dr. Edward (Ed) Purdy



Foreword

The International Ocean Discovery Program (IODP) represents the latest incarnation of almost five decades of scientific ocean drilling excellence and is generally accepted as the most successful international collaboration in the history of the Earth sciences. IODP builds seamlessly on the accomplishments of previous phases: the Deep Sea Drilling Project, Ocean Drilling Program, and Integrated Ocean Drilling Program. The 2013–2023 IODP Science Plan (*Illuminating Earth's Past, Present, and Future*) defines four themes and thirteen challenges for this decade of scientific ocean drilling that are both of fundamental importance in understanding how the Earth works and of significant relevance to society as the Earth changes, at least in part in response to anthropogenic forcing. This phase of IODP represents a renewed level of international collaboration in bringing diverse drilling platforms and strategies to increasing our understanding of climate and ocean change, the deep biosphere and evolution of ecosystems, connections between Earth's deep processes and surface manifestations, and geologically induced hazards on human timeframes.

The *Proceedings of the International Ocean Discovery Program* presents the scientific and engineering results of IODP drilling projects, expedition by expedition. As in the preceding Integrated Ocean Drilling Program, expeditions in the new IODP are conducted by three implementing organizations, each providing a different drilling capability. These are the US Implementing Organization (USIO; through September 2014) and the *JOIDES Resolution* Science Operator (JRSO; as of October 2014), providing the leased commercial vessel *JOIDES Resolution* for riserless drilling operations; JAMSTEC's Center for Deep Earth Exploration (CDEX), providing the drillship *Chikyu* for riser and occasional riserless operations; and the European Consortium for Ocean Research Drilling (ECORD) Science Operator (ESO), providing "mission-specific" platforms (MSPs) for expeditions that extend the IODP operational range where neither drillship is suitable, for example, in polar environments and in shallow waters. Scheduling decisions for each capability are made by three independent Facility Boards, each of which includes scientists, operators, and platform funding partners: the *JOIDES Resolution* Facility Board (JRFB), *Chikyu* IODP Board (CIB), and ECORD Facility Board (EFB). At the beginning of the new IODP, the three Facility Boards agreed to utilize Publication Services at the USIO and now the JRSO for production of all expedition *Proceedings* volumes and reports.

The new IODP differs from prior scientific ocean drilling programs in that it has neither a central management organization nor commingled funding for program-wide activities. Yet this phase of IODP retains a fundamental integrative structural element: a "bottom-up" evaluation of all proposals for drilling expeditions by a single advisory structure composed of scientists representing all international program partners. International scientists may submit drilling proposals to the Science Support Office; all submitted proposals are then evaluated by a Science Evaluation Panel in the context of the Science Plan.

The new IODP also has a second internationally integrative level for high-level discussion and consensus-building: the IODP Forum. The Forum is charged with assessing program-wide progress toward achieving the Science Plan. At present, IODP involves 26 international financial partners, including the United States, Japan, an Australia/New Zealand consortium (ANZIC), Brazil, China, India, South Korea, and the eighteen members of ECORD (Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom). This enhanced membership in the new IODP represents a remarkable level of international collaboration that remains one of the greatest ongoing strengths of scientific ocean drilling.

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JOIDES Resolution Science Operator

Website: <http://iodp.tamu.edu>

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IODP publications

Scientific Prospectus

- Betzler, C., Eberli, G.P., Giosan, L., and Alvarez Zarikian, C.A., 2014. *Expedition 359 Scientific Prospectus: Sea Level, Currents, and Monsoon Evolution in the Indian Ocean*. International Ocean Discovery Program. <http://dx.doi.org/10.14379/iodp.sp.359.2014>
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- Betzler, C.G., Eberli, G.P., Alvarez Zarikian, C.A., and the Expedition 359 Scientists, 2016. *Expedition 359 Preliminary Report: Maldives Monsoon and Sea Level*. International Ocean Discovery Program. <http://dx.doi.org/10.14379/iodp.pr.359.2016>

Proceedings volume

- Betzler, C., Eberli, G.P., Alvarez Zarikian, C.A., and the Expedition 359 Scientists, *Maldives Monsoon and Sea Level*. Proceedings of the International Ocean Discovery Program, 359: College Station, TX (International Ocean Discovery Program). <http://dx.doi.org/10.14379/iodp.proc.359.2017>

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